

Abstract

5 A liquid cooling system utilizing minimal size and volume enclosures, air pockets, compressible objects, and flexible objects is provided to protect against expansion of water-based solutions when frozen. In such a system, pipes, pumps, and heat exchangers are designed to prevent cracking of their enclosures and chambers. Also described are methods of preventing cracking in a liquid cooling system. In all these cases, the system must be designed to tolerate expansion when water is frozen.